

REMARKS

The Office Action mailed January 15, 2003 has been carefully reviewed and the foregoing amendment and following remarks are made in consequence thereof.

Claims 1-31 are now pending in this application. Claims 1-31 stand rejected.

The undersigned wishes to thank the Examiner for the courtesies extended in a telephonic interview on July 1, 2003, in which the Bruckner and Hawthorne references were discussed and amendments were proposed to address differences between the prior art and the present invention. Further, differences between attitude and heading as they relate to the present invention and prior art references was discussed. No agreement was reached on the pending claims.

The rejection of Claims 1-5, 12-19, and 28-31 under 35 U.S.C. § 103 as being unpatentable over Bruckner (U.S. Pat. No. 6,266,582) in view of Hawthorne (U.S. Pat. No. 6,263,266) is respectfully traversed.

Bruckner describes a global positioning system (GPS) backup for an inertial measurement unit having dual GPS receivers 10 that utilize two antennas (12, 14), one antenna for each channel. The GPS provides coordinate information for the location of each of the antennas, therefore the attitude, and any change thereof, of the aircraft perpendicular to the antenna directional axis 18 may be determined by solving the two-point equation for the line which passes through the antenna coordinates. Determination of the rate of change of the attitude of the aircraft 16 may be determined by evaluation of the change in the coordinate positions of the antennas (12, 14) with respect to a given time reference which is also provided in the GPS signal. Thus, a dual GPS receivers system utilizing a two antenna installation may provide the same information and functionality of two axis IMUs, which provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground.

Notably, Bruckner does not describe nor suggest determining an accurate heading of a locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.

Hawthorne describes a method of optimizing train operation and training in a moving train that includes determining the train's conditions and calculating a desired response to the present conditions of the train to achieve a goal. The method of optimizing train operation includes determining conditions of location, track profile and train forces of the train. A set of preliminary train restraint operating parameters are determined from the determined conditions. Also, a set of preliminary train optimizable operating parameters to minimize train forces, to maximize fuel efficiency and to minimize time to destination is determined.

Notably, Hawthorne does not describe nor suggest an inertial measurement system. Therefore there is no motivation to provide for a redundant inertial measurement system as asserted in the Office Action. Hawthorne, also does not describe nor suggest determining an accurate heading of a locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.

Preliminarily, Applicants wish to respond to the Response to Arguments section of the Office Action. The Office Action states that an "aircraft moves in reverse when moving on the ground at an airport." Although such movement may be true, it is not the teaching of Bruckner and Bruckner does not describe nor suggest determining a heading wherein heading represents the direction of travel. Applicants respectfully submit that when an airplane is being moved in reverse on the ground at an airport, a heading indicator, if it has one, does not indicate the direction of travel, but rather indicates a direction other than the direction of travel, for example, the direction the nose of the aircraft is pointing. Additionally, a heading indicator on an aircraft rarely, if ever, indicates the direction of travel of the aircraft. A crab angle is the angular offset between a heading and a direction of travel. For the heading to equal the direction of travel an aircraft would have to fly in still air, a pure head wind, or a pure tail wind. Bruckner does not describe nor suggest determining a heading using a GPS system, correcting a heading to account for a crab angle to determine a direction of travel, nor does Bruckner describe or suggest determining a direction of travel when the aircraft is moving nose first or tail first.

Applicants disagree with the assertion in the Office Action that dead reckoning sensors are the same as inertial measurement systems and Applicants reiterate that Hawthorne does not describe nor suggest an inertial measurement system. Rather, Hawthorne describes at column 10, lines 32-45 that three different sources of information for determining the location of a train are derived, weighted and combined as an estimation of location:

A first source for information is transmitted to the train. This is available from geographical positions system (GPS) which is used to detect the precise latitude and longitude of the head of the train. Another commercially available system uses transponders buried at spaced intervals under the rail. The locomotive equipped with a transceiver activates transponders as they pass over them. The transponder then transmits an encoded message that, when deciphered, provides track location. As another alternative, the train engineer can enter mile post signs which would then be compared against the track data base to determine location.

Although, Hawthorne describes various methods of determining an estimation of the location of a train, Hawthorne does not describe nor suggest determining the heading of a locomotive wherein the heading represents the direction of travel of the locomotive, nor does Hawthorne describe or suggest an inertial measurement system.

Since Bruckner only suggests using GPS to backup an inertial measurement system due to the cost of redundant inertial measurement systems, and Hawthorne does not describe nor suggest an inertial measurement system, the teaching and motivation for combining Bruckner with Hawthorne could not have come from Bruckner or Hawthorne, therefore the combination is improper.

The Office Action states "[a]pplicant seems to be confusing attitude with heading. Change in attitude is used to find heading. Successive values of attitude and position of the antennas would be used to determine heading." Applicants respectfully submit those teachings are not found within the cited art. Bruckner does not describe nor suggest using attitude information to determine heading wherein heading represents the direction of travel of the locomotive. Applicants respectfully request a cite to the source of the statements, "[c]hange in attitude is used to find heading," and "[s]uccessive values of attitude and position of the antennas would be used to determine heading."

At column 3, lines 5-7, Bruckner recites "a dual GPS receivers system utilizing a two antenna installation may provide the same information and functionality of two axis IMUs." Further, at column 3, lines 9-14, Bruckner recites "an aircraft may utilize a dual IMU (gyroscope) installation...wherein the first IMU 20 may provide attitude and rate of change

of attitude about a first directional axis 22 (e.g., the left side of the aircraft) and a IMU 24 may provide attitude and rate of change of attitude about a second directional axis." Accordingly, Bruckner only describes an IMU providing attitude and rate of change of attitude information and that a dual GPS receiver system utilizing a two antenna installation may provide the same information and functionality of two axis IMUs and does not describe nor suggest heading information being provided by the IMUs or the GPS system.

Although it is asserted within the Office Action that Bruckner teach the present invention except for disclosing the vehicle is a locomotive, and that Hawthorne discloses a vehicle that is a locomotive, no motivation nor suggestion to combine the cited art has been shown. Since there is no teaching nor suggestion in the cited art for the claimed combination, the Section 103 rejection is based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicants request that the Section 103 rejection of Claims 1-5, 12-19, and 28-31 be withdrawn.

Furthermore, Applicants respectfully submit that no motivation for the combination can be found within Bruckner and Hawthorne, as Bruckner and Hawthorne teach away from each other. Bruckner describe, at column 3, lines 5-7, a GPS receiver antenna system that may provide the same information and functionality of two axis inertial measurement units (IMUs) and at column 1, lines 18-20, that IMUs provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground. In addition, Bruckner describes, at column 3, lines 40-44, that using three GPS receivers and three antennas strategically mounted on the aircraft, three dimensional inertial information about three orthogonal axes of the aircraft may be obtained and at column 3, lines 52-53 that relative rotational movement of both antennas 14 and 20 with respect to antenna 12 may provide a combination of roll, pitch and yaw information. Clearly, the three orthogonal axes of the aircraft are roll, pitch and yaw information and not heading information wherein the heading represents the direction of travel. Specifically, Bruckner do not describe nor suggest determining an accurate heading of the locomotive, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.

In contrast, Hawthorne describes determining a position of a lead locomotive of a train consist using a GPS and does not describe nor suggest determining an accurate heading

of the locomotive, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive. Specifically, at column 10, lines 36-38, Hawthorne describes "a geographical positions system (GPS) which is used to detect the precise latitude and longitude of the head of the train", and at column 5, lines 60-62 that "[p]osition is determined from wheel movement sensors and a Global Positioning System (GPS)."

If art "teaches away" from a claimed invention, such a teaching supports the nonobviousness of the invention. U.S. v. Adams, 148 USPQ 479 (1966); Gillette Co. v. S.C. Johnson & Son, Inc., 16 USPQ2d 1923, 1927 (Fed. Cir. 1990). In light of this standard, it is respectfully submitted that the cited art, as a whole, is not suggestive of the presently claimed invention. More specifically, Applicants respectfully submit that Hawthorne teaches away from Bruckner, and as such, there is no suggestion or motivation to combine Bruckner with Hawthorne.

Further, and to the extent understood, no combination of Bruckner and Hawthorne, describes or suggests the claimed combination, and as such, the presently pending claims are patentably distinguishable from the cited combination. Specifically, Claim 1 recites a method that includes "determining an accurate heading of the locomotive during normal locomotive transit operation using the set of phase differences between the satellite reference signals, wherein the locomotive is self-propelled or propelled in a consist with other locomotives, wherein the heading represents both the direction of travel and which end of the locomotive is in the lead in the direction of travel of the locomotive."

The combination of Bruckner and Hawthorne does not describe nor suggest a method that includes determining an accurate heading of the locomotive during normal locomotive transit operation using the set of phase differences between the satellite reference signals, wherein the locomotive is self-propelled or propelled in a consist with other locomotives, wherein the heading represents both the direction of travel and which end of the locomotive is in the lead in the direction of travel of the locomotive. Accordingly, for at least the reasons set forth above, Claim 1 is submitted to be patentable over Bruckner in view of Hawthorne.

Claims 2-14 and 30 are dependent from independent Claim 1, and are respectfully submitted to be patentable along with and for the same reasons as claim 1.

Claim 15 recites an apparatus for determining at least one of motion and location parameters of a railroad locomotive to detect curves and reduce track wear, with the locomotive oriented with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes "at least two phase-locking satellite receivers configured to reference signals received from a set of satellites...a processor configured to determine a set of phase differences between the reference signals received by said satellite receivers and an accurate heading of the locomotive during normal locomotive transit operation using the set of phase differences between the reference signals, wherein the locomotive is self-propelled or propelled in a consist with other locomotives, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive."

Applicants respectfully submit that the proposed modification would render the proposed combination of prior art references unsatisfactory for its intended purpose. Applicants respectfully submit that flying an aircraft "with either end thereof in the lead in the direction of travel" would render the airplane unsatisfactory for its intended purpose therefore there is no suggestion or motivation to make the proposed modification. Further, Applicants submit there is no motivation to determine the attitude of an aircraft when an aircraft is being moved in reverse on the ground at an airport, as the aircraft is not in control of its attitude and assumes the known attitude of the runway, tarmac, or taxiway, therefore a backup system to an attitude determining system is unsatisfactory for its intended purpose of providing backup at a lower cost than inertial measurement systems.

Furthermore, the combination of Bruckner and Hawthorne does not describe nor suggest an apparatus for determining at least one of motion and location parameters of a locomotive to detect curves and reduce track wear, with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes at least two phase-locking satellite receivers configured to reference signals received from a set of satellites, a processor configured to determine a set of phase differences between the reference signals received by the satellite receivers and an accurate heading of the locomotive during normal locomotive transit operation using the set of phase differences between the reference signals, wherein the locomotive is self-propelled or propelled in a consist with other locomotives, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Specifically, neither

Bruckner nor Hawthorne, alone or in combination describe or suggest a processor configured to determine a set of phase differences between the reference signals received by the satellite receivers and an accurate heading of the locomotive during normal locomotive transit operation using the set of phase differences between the reference signals, wherein the locomotive is self-propelled or propelled in a consist with other locomotives, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Accordingly, for at least the reasons set forth above, Claim 15 is submitted to be patentable over Bruckner in view of Hawthorne.

Claims 16-31 are dependent from independent Claim 15, and are respectfully submitted to be patentable along with and for the same reasons as claim 15.

The rejection of Claims 10, 11, and 24-27 under 35 U.S.C. § 103 as being unpatentable over Bruckner in view of Hawthorne and further in view of Kumar (U.S. Pat. No. 5,896,947) is respectfully traversed.

Claims 10 and 11 depend, directly or indirectly, from independent Claim 1, which is submitted to be patentable for the reasons set forth above. When the recitations of Claims 10 and 11 are considered in combination with the recitations of Claim 1, Applicants submit that Claims 10 and 11 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Kumar.

Claims 24-27 depend, directly or indirectly, from independent Claim 15, which is submitted to be patentable for the reasons set forth above. When the recitations of Claims 24-27 are considered in combination with the recitations of Claim 15, Applicants submit that Claims 24-27 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Kumar.

The rejection of Claims 6-9, and 20-23 under 35 U.S.C. § 103 as being unpatentable over Bruckner in view of Hawthorne and further in view of Bidaud (U.S. Pat. No. 6,347,265) is respectfully traversed.


Claims 6-9 depend, directly or indirectly, from independent Claim 1, which is submitted to be patentable for the reasons set forth above. When the recitations of Claims 6-9 are considered in combination with the recitations of Claim 1, Applicants submit that

Claims 6-9 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Bidaud.

Claims 20-23 depend, directly or indirectly, from independent Claim 15, which is submitted to be patentable for the reasons set forth above. When the recitations of Claims 20-23 are considered in combination with the recitations of Claim 15, Applicants submit that Claims 20-23 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Bidaud.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



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